US EPA Mid-Continent Ecology Division

Research Project Summary

Ecotoxicology Databases and Expert Systems

Overview

One of EPA's long-term goals is to facilitate the exchange of credible scientific data and risk assessment information among private and public stakeholders. To meet this objective, this Division has developed a suite of databases and expert systems that can be used by risk assessors and researchers to quickly locate relevant ecotoxicology data and models.

ECOTOX is a comprehensive database, which provides information on adverse effects of single chemical stressors to ecologically relevant aquatic and terrestrial species. ECOTOX is available on EPA's public web page at http://www.epa.gov/ecotox/. The database is updated on a quarterly basis and includes more than 440,000 records abstracted from 18,800 publications, addressing the adverse effects of 8,400 chemicals to 5,900 terrestrial and aquatic species. All pertinent information on the species, chemical, test methods, and results are abstracted and encoded into the database. ECOTOX also includes third-party data collections from the EPA, U.S. Geological Survey, Russia, and OECD (Organization for Economic Cooperation and Development) member nations, summarizing research that is either published in non-English journals or not available in the open literature. One of these data files is the Division's fathead minnow acute toxicity database used in the development of structure-activity relationships.

Researchers at this Division have also developed a Toxicity/Residue database summarizing data for aquatic organisms exposed to inorganic and organic chemicals. This database is an invaluable resource for use in the systematic investigation of hypotheses related to effect/residue relationships. The database contains more than 3,000 effect and no-effect endpoints for survival, growth, and reproductive parameters for invertebrates, fish, and aquatic life-stage of amphibians.

Under this Divison's research effort, these data systems are used to develop models to predict the effects of chemicals and/or species that lack toxic effects data. An example is the ASTER (ASsessment Tools for the Evaluation of Risk) system, which integrates the aquatic component of ECOTOX with a structure-activity based expert system. ASTER is designed to provide high quality data for discrete chemicals when available in the associated databases, and QSAR-based estimates when data are lacking.

Key Products

Russom CL 2002. Mining environmental toxicology information: Web resources. Toxicology 173:75-88.

Russom CL, Bradbury SP, Broderius SJ, Hammermeister DH, and Drummond RA. 1996. Predicting modes of toxic action from chemical structure: Acute toxicity in fathead minnow (*Pimephales promelas*). Environ Toxicol Chem 16:948-967.

Jarvinen AW and Ankley GT. 1999. Linkage of effects to tissue residues: Development of a comprehensive database for aquatic organisms exposed to inorganic and organic chemicals. SETAC Press, pp. 1-358.

Russom CL, Breton RL, Walker JD, and Bradbury SP. 2003. An overview of the use of quantitative structure-activity relationships for ranking and prioritizing large chemical inventories for environmental risk assessments. Environ Toxicol Chem 22:1810-1821.

http://www.epa.gov/ecotox
http://www.epa.gov/med/databases/tox_residue.htm
http://www.epa.gov/med/databases/fathead_minnow.htm
http://www.epa.gov/med/databases/aster.htm

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